



## **Quick Start Guide**

QG000157

# **AS7341 Discrete Demo Kit**

**Spectral Presence Demo for AS7341 Sensor +  
Unicom Communications Board**

**Demo Kit Quick Start Guide**

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# Content Guide

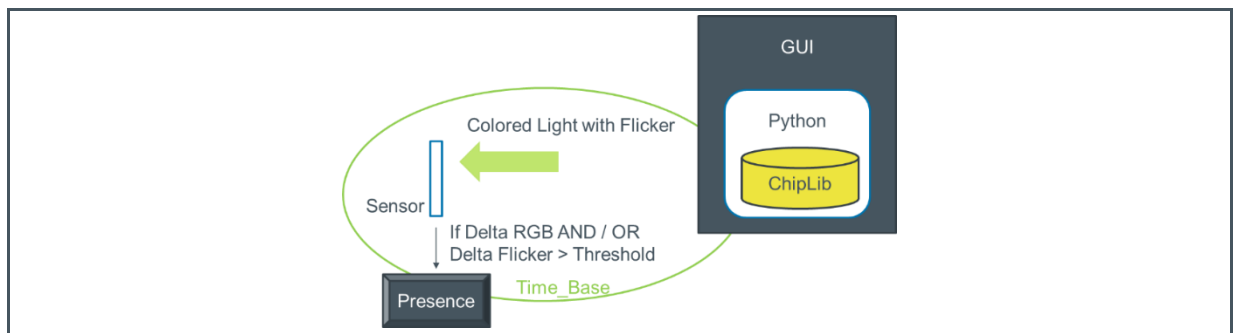
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# 1 Introduction

The 'Spectral Presence' demonstration measures the ambient light incident on an AS7341 spectral sensor, converts those to digital values to create a RAW spectrum from which a color and flicker value are generated. Both values are checked for variations over time to trigger a 'presence event'<sup>1</sup>.

**Figure 1:**  
**AS7341 Demo Spectral Presence Based on a Modular Software Concept**



A 'presence event' is detected if the parameters color and/or flicker over the time base by more than the selected threshold values - changes are detected as a new presence, and the new presence is shown as a green light. The new values for 'Presence' are then used again, and the algorithm restarts and checks for a newer presence event. If the criteria do not exceed the threshold values within the period, no new presence is detected - no movement and no presence. The presence light turns red, and after the time has expired, the algorithm starts again.

Flicker and color limits can logically be combined with 'AND' or 'OR' as criteria.

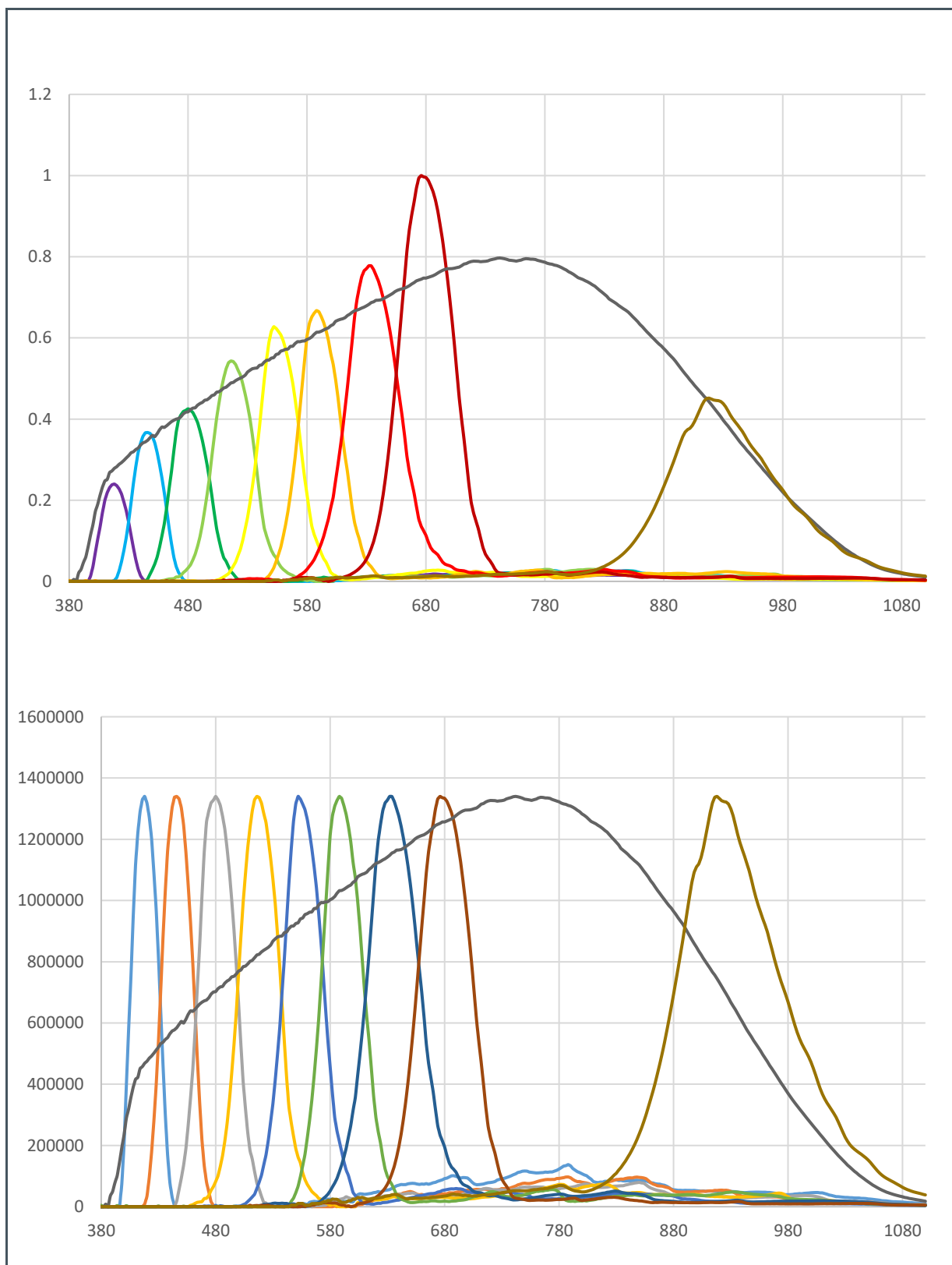
Flicker is measured as a 0-1 sequence via a sensor channel; the DC part is detected and cleared. Then the average value of the sequence is determined and compared with the previous measurement. If the percentage change of the mean value is greater than the set limit value, a presence is indicated.

The color determination is based on scaled sensor values with a convolution of the CIE1931 function and subsequent XYZ to RGB transformation (0...255 each). The threshold value in the GUI is given in percent and refers to the RGB transformation and deviation from the previous presence in percent as a color space error in the RGB model ( $\Delta RGB = \sqrt{Rdiff^2 + Gdiff^2 + Bdiff^2}$ ).

The scaling of the sensor values is based on a simple white balance of one EVK and considers the different channels in the visible range. It takes into account exactly one correction value per channel, which scales the channels to each other to a unit value based on their sum of sensitivity in the transmission.

<sup>1</sup> It is a simple logic chain implemented with a sensor. A new presence means a change of light through movement in front of the sensor.

**Figure 2:**  
**AS7341 Filter Sensitivity (Raw Top, Scaled Bottom) Based on Filter Design Data**



The sensor works continuously and automatically, with corrections based on the input data of the *Init\_file.txt* (located where the .exe is installed). The sensor board and the PC interface is an AS7341 EVK standard test kit. It is described in detail in other manuals and application notes. Since the demo conditions are potentially non-diffuse, the sensor board contains a diffuser mounted in front of the sensor.

The software and GUI have been developed as modular software concepts specifically for the application 'Spectral Presence', using all sensor functions directly from the AS7341 ChipLib. The algorithms of the demo are implemented in Python. All inputs and outputs as well as the setup for the demo currently work on a Windows-based PC platform.

The demo is not a series development and only shows the basic proof of concept of the sensor for this application. The controllable parameters and observed accuracies do not represent the full range of development target values and were only chosen and implemented for this demo. The demo is not an off-the-shelf item. To obtain a demo kit or copy of this demo, contact your local FAE or the **ams** AWS business line.

## 2 What is in the Box

AS7341 EVK Presence Demo hardware consists of an AS7341 Sensor Board, Unicom communications and interface board<sup>2</sup>, and ribbon cable. The manual for the AS7341 EVK (UG000400) describes the AS7341 complete Sensor board and hardware. The functional and specification details for the AS7341 sensor IC are available in the AS7341 Sensor device datasheet.

The sensor and Unicom board are connected via a ribbon cable. Always secure this connection before connecting the boards to communications and power via a standard micro-USB to USB type.

The Presence Demo consists of the following items, shown in Figure 3.

**Figure 3**  
**Kit Content of EVK Variant ALS**

Item 1	Item 2	Item 3
USB 3.0 Cable	Sensor Hardware and Interface in Plastic Housing with Front Adapter (front and back side)	USB Stick
		

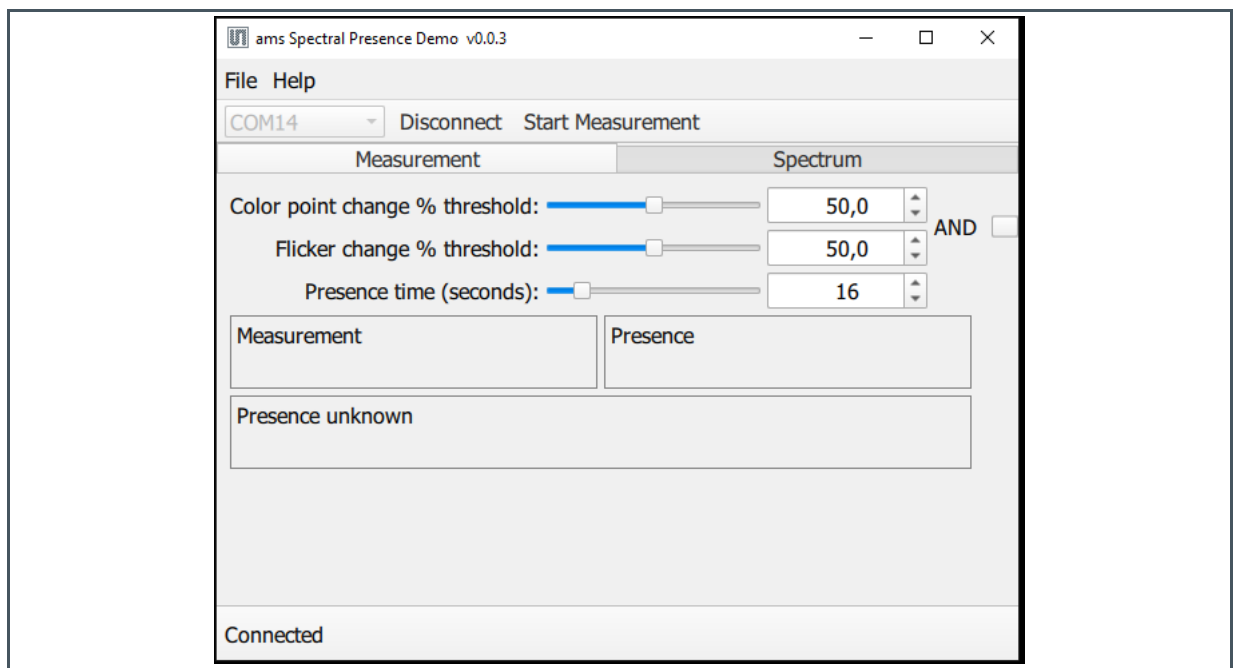
Item No.:	Item	Comment
1	USB 3.0 Cable	
2	990601159	AS7341 EVK Fast Demo Hardware in Plastic Housing with 0°/45° Front Adapter, V2.0
3	USB Data Stick	Documents, software, firmware and drivers

<sup>2</sup> FTDI alternative also possible – see AS7341 EVK ALS manual

### 3 Software

There is no special software installation process necessary. To start the demo, connect the sensor and Unicom boards via the supplied ribbon cable, connect the USB cable, and double click the executable file *AS7341-presence-demo.exe*. The software algorithms were developed based on Python using the AS7341 ChipLib and integrated into a Windows-based GUI. The GUI starts with a basic tab to connect the demo hardware and control the workflow after setting all parameters. Press the “Connect” button to connect the demo kit to the GUI. After a successful connection, the button changes to “Disconnect”, which will terminate the communications to the demo boards.

**Figure 4:**  
**Main Tab in AS7341 Spectral Presence Demo**



Once connected, the user can set the threshold values in percent for RGB color and flicker variations, select the logical condition for the thresholds, specify the ‘Presence\_time’, and ‘Start Measurement’.

The data flow, from the sensor raw values in the visible range to the evaluation of changes in color and flicker, is fully automated in the GUI. The complete data transformation process requires only a few correction values or constants for the transformations, which are listed and explained in the initialization file ‘*init\_file.txt*’.

**Figure 5:**  
**Init\_file.txt to Control the GUI**

```
# AS7341 presence demo initialization data file

[Config]

# Correction factor of raw values - normalization of raw counts to see colors
similar to human eyes - corection values were done by a LED based white screen

# results of these correction values are calculated XYZ value in GUI which are
transformed into RGB by conversion matrix - see next lines

# change and adapt the correction values in case of wrong colors on screen based
on sensor devie deviations

# F1;F2;F3;F4;F5;F6;F7;F8

CorrectionFactor= 4.1;2.7;4.4;2.0;1.7;1.7;1.28;1.0

# XYZ to RGB conversion matrix - used to print out a color by a windows based GUI
- the matrix insert general matching factors - do not change them

# RX;RY;RZ;GX;GY;GZ;BX;BY;BZ

ConversionXYZ2RGB= 10.03558000;-6.16536100;-
0.54215400;1.36935900;1.00541900;0.57871000;1.15414200;-0.59024700;2.14952500

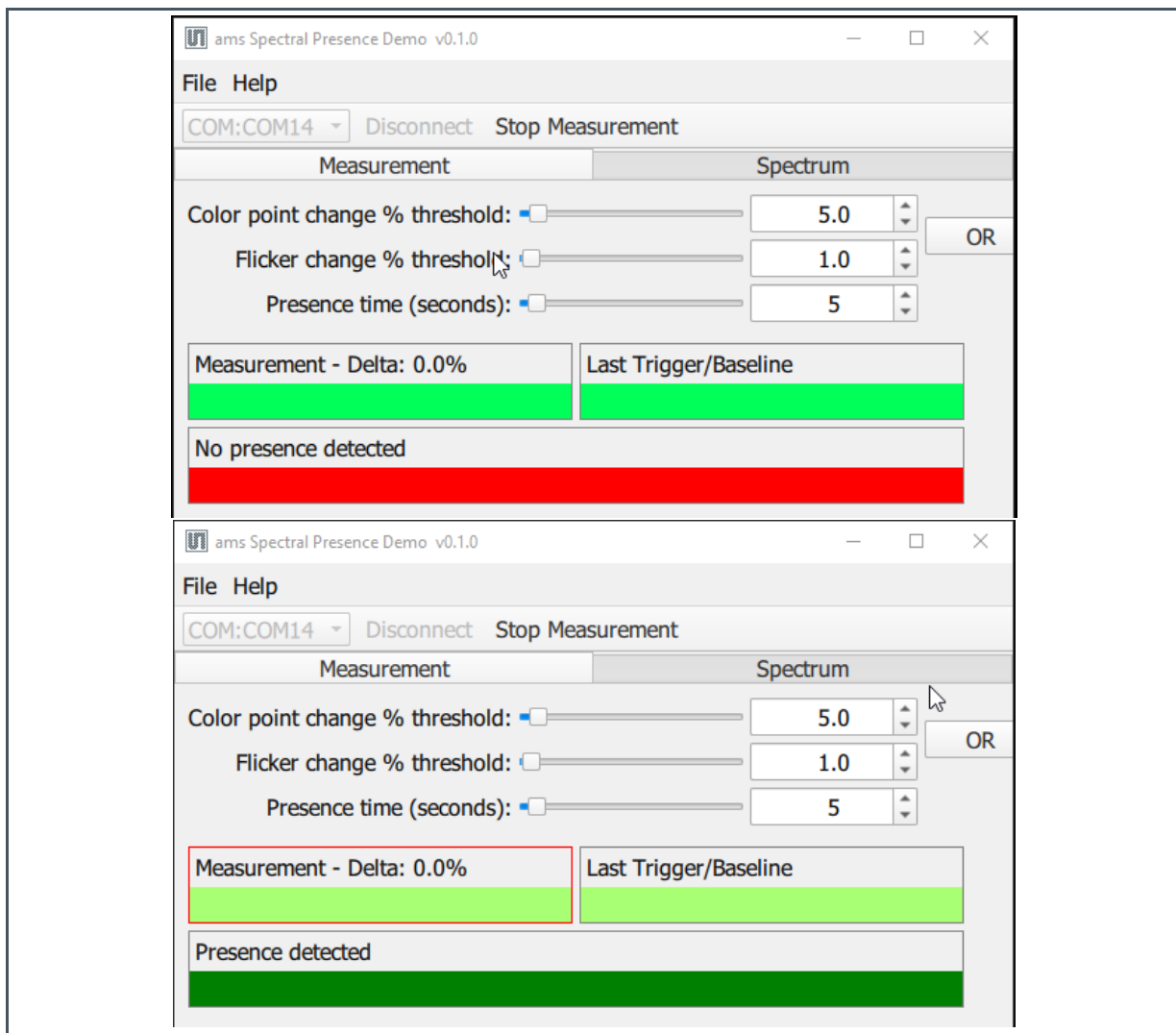
# Integration time [ms] - the higher TINT the more sensitive is the sensor

TInt= 500
```



When the 'Start Measurement' button is clicked, the 'Presence' workflow will begin continuous sensor measurements, corrections, and transformations. The results of the comparison between 'previous presence and current measurement' can be observed in the two colored tiles under the label 'Measurement' and previously or under the label 'Presence', where the percent changes are also displayed.

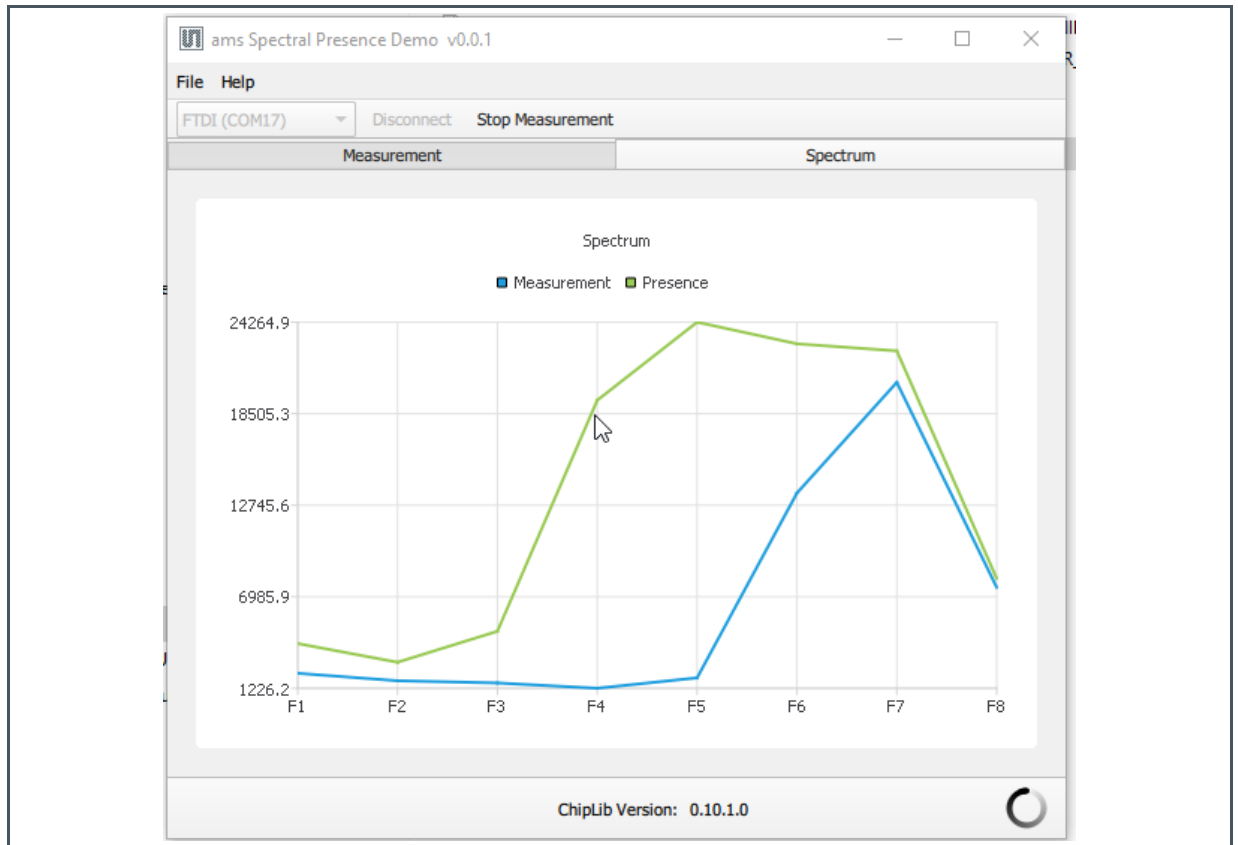
**Figure 6:**  
**Main Tab with 'No Presence in Process' and 'Presence Detected'**



The data-flow in the GUI starts with the sensor counts and its correction by the scaling vector (see scaling values, Figure 3 and footnote 1). The corrected sensor values are immediately transformed from scaled Sensor counts into XYZ values by multiplying them with the CIE1931 standard observer function. Then they are converted into RGB color values (without active color measurement and calibrated displays) via a simple matrix transformation 'XYZtoRGB'. This should show a similar color on a conventional display that matches the approximated ambient color in front of the sensor.

Alternatively, a second tab, 'Spectrum', is available, showing the sensor results in an alternative form. Figure 7 shows the spectra, which are the bases for the files 'Measurement' and 'Presence'.

**Figure 7:**  
**Spectral Tab in AS7341 Spectral Presence Demo**



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